

[54] **DOOR LATCH**

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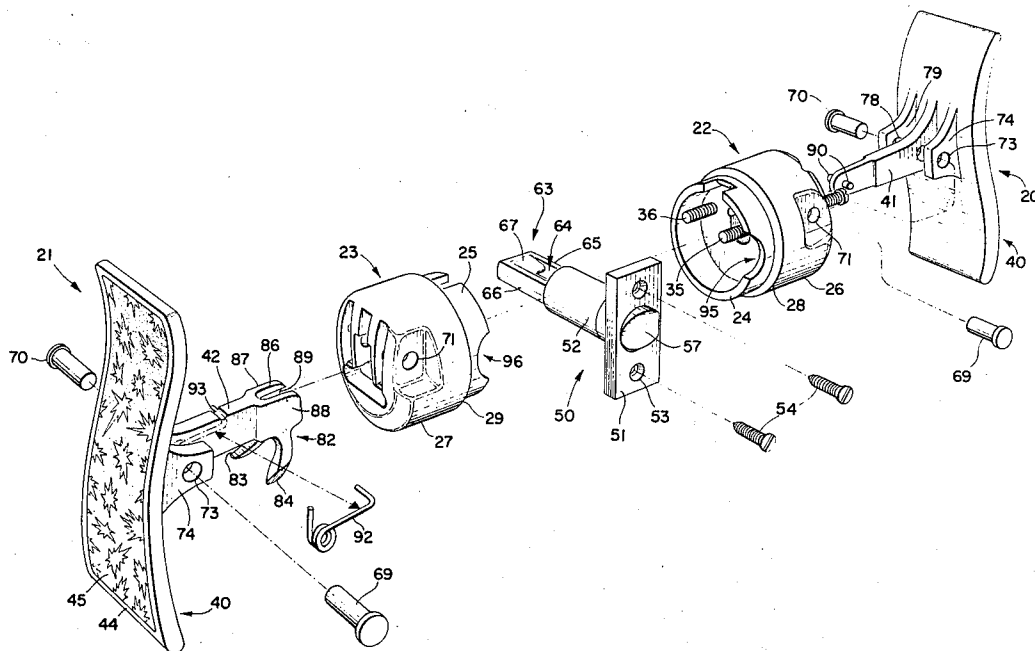
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[57]

ABSTRACT

A door latch which can be mounted on doors of different thicknesses and at either side edge of a door without requiring any adjustment or modification of the latch includes a pair of pivotally mounted handles, each of which has a stem which extends inwardly into an opening provided in the door. A cam member is operatively associated with a latch bolt disposed in a passage extending from a side edge of the door inwardly therefrom and such cam member is in turn operatively associated with another cam member which undergoes generally translational movement within the door when either of the handles is pivoted about its pivot axis, each such axis being disposed generally parallel to the latch bolt passage.

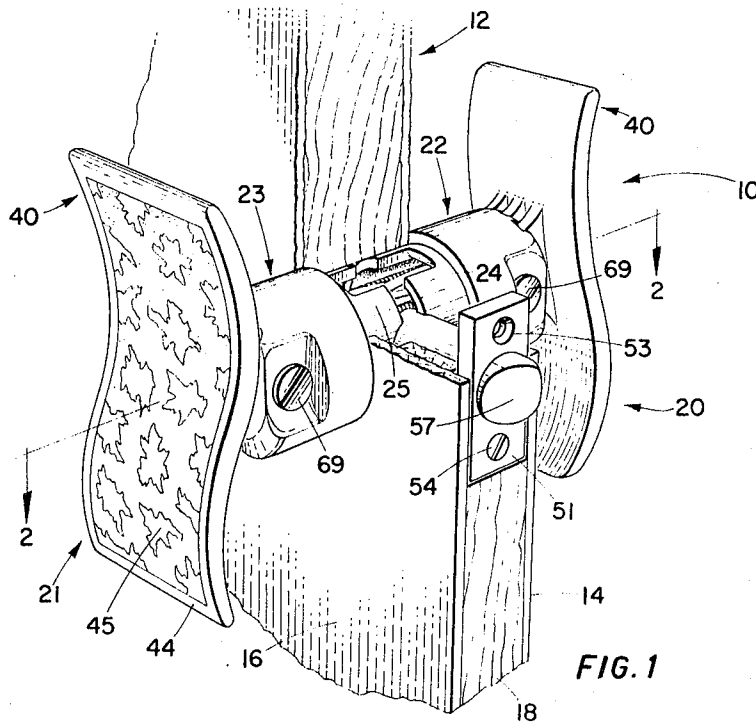
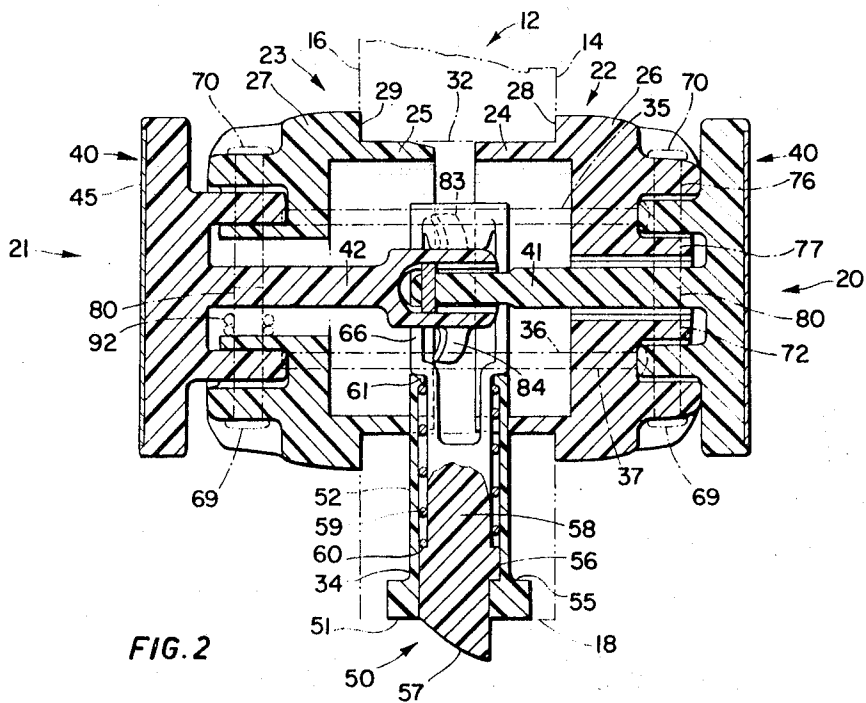
12 Claims, 4 Drawing Figures



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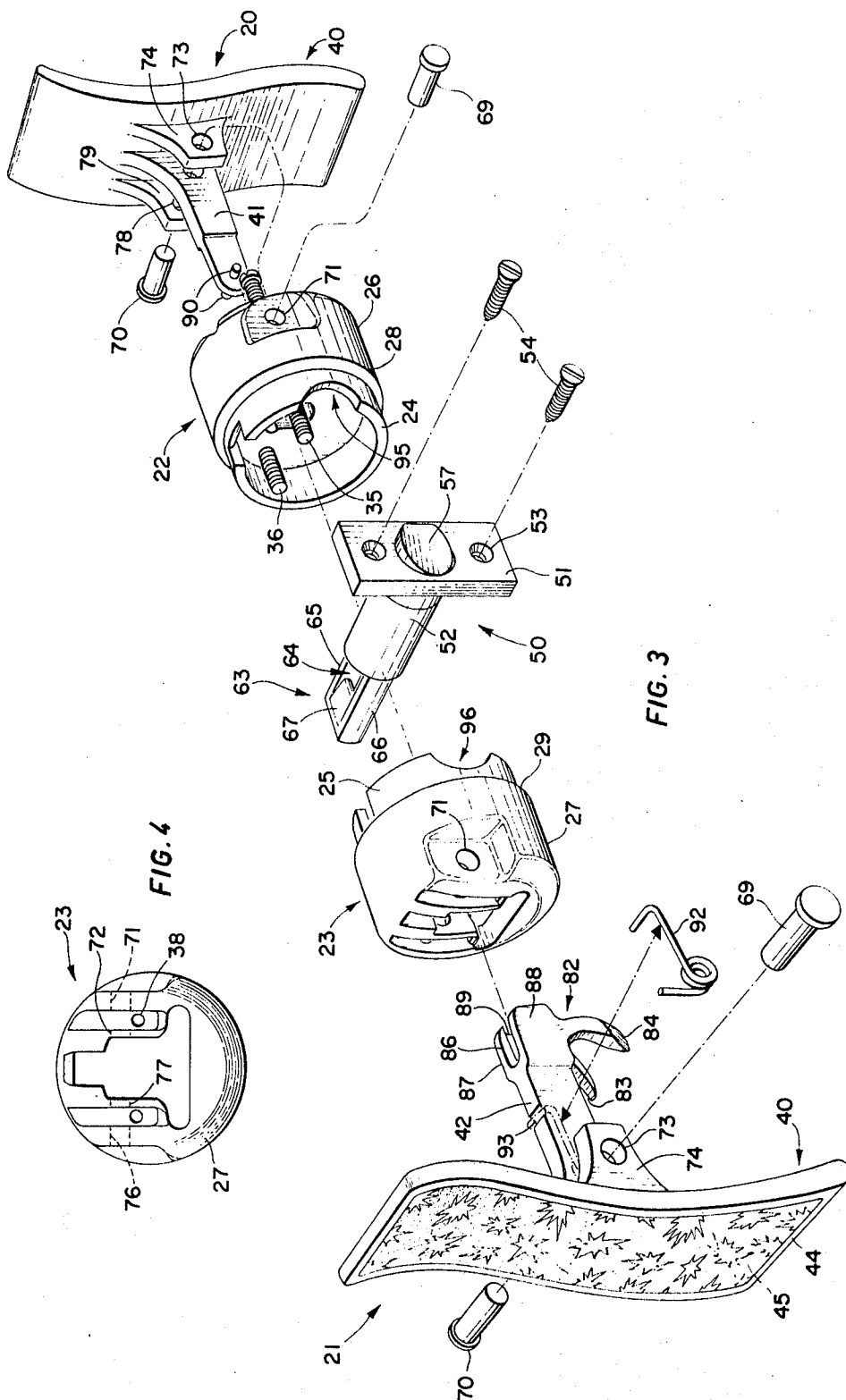


FIG. 3

FIG. 4

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DOOR LATCH

BACKGROUND OF THE INVENTION

The present invention relates to door latches and is concerned primarily with such latches that have very simple and inexpensive constructions and which can be readily installed on doors of different thicknesses and on both the left-hand and right-hand sides of such doors.

At the present time, push-pull door latches are known and are recognized as having considerable utility since they permit a door to be unlatched and opened by a single operating movement, the first part of the movement retracting the latch bolt and the last part actually opening the door.

The principal disadvantage presented by known push-pull door latches is the complex nature of their operating mechanisms. Accordingly, an important object of the present invention is to provide a door latch of a particularly simple construction. More particularly, it is an object of this invention to provide a door latch which can be manufactured to a major extent from appropriate and relatively inexpensive plastic materials.

Doors for homes and other buildings are normally produced by manufacturers in standard sizes and thicknesses. The building trade does, however, accept variations in the thickness of a standard door of plus or minus one-eighth of an inch. This means that, when a latch is installed on a door, it should preferably be capable of being adjusted accurately to fit the thickness of that particular door. It is accordingly an important object of the present invention to provide a push-pull latch which can be installed in a door of any thickness within an appreciable range of thicknesses without requiring adjustments or alterations to be made to the latch itself.

Presently known latches are initially assembled for mounting at only one side edge of a door. To use such a latch at the opposite side edge of a door, it is generally necessary with existing latches to alter the latch to accommodate this change. At the present time, there is not available a push-pull latch which may be installed as such and without change, at either side edge of a door. It is another object of the present invention to provide a push-pull latch which can be installed without modification, at either side of a door in a particularly simple manner.

While handles for door latches have been provided in many shapes and forms, there is no handle presently available commercially for a push-pull latch which can readily be adapted to have its external appearance readily changed. Accordingly, another object of the present invention is to provide a door latch including handles on which a desired face panel may be secured in particularly simple manner.

Yet another object of the present invention is to provide a push-pull latch including a minimum number of structural components thereby facilitating its manufacture and reducing the cost of such manufacture.

SUMMARY OF THE INVENTION

In its broadest scope, the present invention provides a latch for use in a door having a first face, a second face generally parallel to said first face, a side edge extending between said first and second faces, an opening extending through said door between said first and second faces thereof generally perpendicularly to said first and second faces of said door, and a passage extending from said side edge of said door into said opening, which latch comprises a pair of handle-mounting members each adapted to be secured in position about said opening extending through said door at a respective one of said first and second faces of said door; first and second handles pivotally mounted on respective ones of said handle-mounting members about axes generally parallel to said passage in said door and each said handle having an elongated stem adapted to extend into said opening in said door; a latch bolt adapted to be guided in said passage in said door for movement between an extended door-latching position and a retracted door-unlatching position; a first cam member opera-

tively associated with said latch bolt for axial movement therewith along said passage; a second cam member operatively associated with said elongated stems of said first and second handles and adapted to be disposed in said opening in said door in engagement with said first cam member for generally translational movement of said second cam member in a cam plane disposed intermediate said first and second faces of said door and generally parallel thereto in response to pivotal movement of said first and second handles to move said latch bolt between said door-latching and door-unlatching positions; and a spring means biasing said latch bolt into said door-latching position, whereby said latch bolt is moved from said door-latching position into said door-unlatching position on pivoting movement of either of said handles about their axes.

As will be more readily more understood when the particular embodiment of a latch in accordance with the invention and as illustrated in the accompanying drawings is described hereinafter in greater detail, such a latch is usefully formed from a suitable plastic material such as an acetal resin, although the manufacture of the latches of the invention from other materials is not precluded.

In accordance with another useful feature of the present invention, the first and second cam members of a latch in accordance therewith are usefully formed in such a way that they can co-engage for any door thickness within a predetermined range of such thicknesses so permitting the use of such a latch on doors of different thicknesses without requiring any adjustment or alteration to be made to the latch.

Frequently, it will be desirable to construct a door latch in accordance with the invention in such a way that it can be fitted on a door at either side edge thereof without requiring any adjustment or alteration to be made to the latch.

In accordance with yet another useful feature of the invention, each handle of a push-pull latch in accordance therewith is usefully formed with a cross-head having a peripheral flange and a decorative face panel secured on the cross-head within such a flange.

Other objects, features and advantages of the invention will become apparent as the description herein proceeds.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described merely by way of illustration with reference to the accompanying drawings in which:

FIG. 1 is a perspective view of a particularly useful embodiment of a door latch in accordance with the invention showing such a latch fitted on a door, part of which is cut away and shown in section to reveal the disposition of the several parts of the latch within the door;

FIG. 2 is a horizontal sectional view through the latch of FIG. 1 when viewed in the direction of the arrows 2—2 of that figure;

FIG. 3 is an exploded perspective view of the latch of FIG. 1 showing further details of the construction thereof; and

FIG. 4 is a side elevation of one of the handle-mounting members of the latch of FIG. 1 when viewed in the direction of the arrows 4—4 of that figure.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the accompanying drawings, there is shown therein generally at 10 a push-pull latch in accordance with the present invention. The latch 10 is shown in FIG. 1 as being mounted on a door generally indicated at 12 and having an inner face 14, an outer face 16 and a side edge 18.

The latch 10 includes an inner or first handle generally indicated at 20 and an outer or second handle generally indicated at 21. The inner handle 20 is pivotally mounted in a manner yet to be described on a first-handle mounting member generally indicated at 22 while the handle 21 is similarly pivotally mounted on an outer handle-mounting member generally indicated at 23.

The handle-mounting members 22 and 23 of the particular latch 10 shown in the drawings each comprises a generally tubular anchoring portion 24 and 25 respectively integrally formed with a larger diameter mounting head 26 and 27 respectively on which the handles 20 and 21 respectively are pivotally mounted. Between each of the anchoring portions 24 and 25 and the respective one of the mounting heads 26 and 27, each of the handle-mounting members 22 and 23 includes a shoulder 28 and 29 respectively adapted to abut a respective one of the inner and outer faces 14 and 16 respectively of the door 12 when the latch 10 is installed thereon.

For securing the latch 10 on the door 12, the latter is provided with a generally cylindrical opening 32 extending between the inner and outer faces 14 and 16 respectively thereof and generally perpendicularly to these faces. The door 12 is also provided with a passage 34 extending from the side edge 18 inwardly into the door between the inner and outer faces 14 and 16 respectively thereof to intercept at its inner end the aforementioned opening 32.

The aforementioned anchoring portions 24 and 25 of the handle-mounting members 22 and 23 respectively extend into the opening 32 from the inner and outer faces 14 and 16 respectively of the door 12 and are retained firmly in position by bolts 35 and 36 extending through unthreaded bores 37 in the inner handle-mounting member 22 and through the opening 32 so as to be received in threaded bores 38 provided for this purpose in the outer handle-mounting member 23 as will be readily understood by reference to FIG. 2 of the accompanying drawings.

In the particular embodiment shown in the accompanying drawings, each of the handles 20 and 21 comprises a cross-head 40 and an elongated stem extending into the opening 32 in the door, the stem for the handle 20 being indicated at 41 while that for the handle 21 being indicated at 42. In accordance with a particularly valuable but optional feature of the present invention, the cross-head 40 of each of the handles 20 and 21 is in the form of a sinuous plate which is provided on its outer surface with a peripheral flange 44 in which there is inset a decorative panel 45. If desired, such decorative panels 45 may be secured to the handles so as to be capable of being replaced as and when desired. Such panels 45 may usefully be in the form of decals which are chosen to provide an aesthetically pleasing effect together with the decorative finishing on and around the door.

The sinuous or curved construction of the cross-heads of the handles 20 and 21 presents a functional advantage in addition to providing a pleasing appearance. The outwardly curved upper portion of such a handle facilitates engagement by a person's hand when a pull is to be exerted on the handle while the inwardly curved lower portion is particularly useful for being pushed. The use of handles of other configurations is, however, equally within the scope of the invention.

Referring further to the latch 10 shown in the accompanying drawings, it will be seen that this latch also includes a latch bolt assembly generally indicated at 50 and comprising an end mounting plate 51 which, in the particular embodiment illustrated, is integrally formed with a sleeve 52 received within the passage 34 in the door 12. Holes 53 are provided in the end plate 51 to receive screws 54 for securing the latch bolt assembly 50 with the end plate 51 thereof disposed in a countersunk rectangular recess 55 provided for this purpose in the side edge 18 of the door at the outer end of the passage 34.

A latch bolt 56 having a head 57 and a shaft 58 is slidingly disposed within the aforementioned sleeve 52 and is urged outwardly thereof by a helical compression spring 59 disposed around the shaft 58. The outer end of the spring 59 abuts a shoulder 60 provided at the inner end of the head 57 of the latch bolt 56 and at its inner end is seated on an annular lip 61 integrally formed with the sleeve 52.

Referring further to the latch bolt 56, it will be seen that, at its inner end, this bolt 56 is integrally formed with an inward extension 63 having an elongated slot 64 formed therein which slot is defined by side arms 65 and 66 terminally inter-

connected by a web 67. The web 67 constitutes the first cam member hereinbefore mentioned of the latch 10 and, for a reason which will be more fully understood as the description herein proceeds, the inner surface of this web 67 is formed with a double chamfer as will best be seen by reference to FIG. 3 of the accompanying drawings. It will now be understood that the first cam member constituted by this web 67 is, as previously indicated, operatively associated with the latch bolt 56 for axial movement therewith along the passage 34.

Referring further to the handles 20 and 21, it will be seen that each of these handles is pivotally mounted on a respective one of the handle-mounting members 22 and 23 by axially aligned and headed pivot pins 69 and 70 disposed outwardly of a respective one of the surfaces 14 and 16 of the door 12 and generally parallel to the aforementioned passage 34 therein. The pin 69 of each of the handles 20 and 21 extends through aligned openings 71 and 72 provided in a respective one of the handle-mounting members 22 and 23 and through an aligned opening 73 in an ear 74 integrally formed with a respective one of the handles 20 and 21. Similarly, the pin 70 of each of the handles 20 and 21 extends through aligned openings 76 and 77 provided in a respective one of the handle-mounting members 22 and 23 and through an aligned opening 78 in an ear 79 integrally formed with a respective one of the handles 20 and 21. The pins 69 and 70 for each handle 20 and 21 are disposed at their inner ends in an aligned opening 80 provided in a respective one of the elongated stems 41 and 42.

The elongated stem 42 of the handle 21 is provided at its inner end with a cam member generally indicated at 82 and disposed so as to project downwardly into the elongated slot 64 provided as an inward extension of the latch bolt 56. When the outer handle 21 is pivotally moved about the axis of its pivot pins 69 and 70, the cam member 82 undergoes generally translational movement in a generally vertical plane intermediate the inner and outer faces 14 and 16 of the door 12. The cam member 82 is formed with a pair of curved cam surfaces 83 and 84 which diverge downwardly and only one of which is effective in any installation for moving the latch bolt 56 in the sleeve 52. The operative one of the cam surfaces 83 and 84 (i.e. surface 83 in the accompanying drawings) is operatively associated with the aforementioned double chamfered web 67 constituting the first cam member of the latch 10. Although the movement of the cam member 82 is generally translational, it will be appreciated that this member actually moves along a small arc having its centre disposed on the axis of the respective pivot pins 69 and 70. For this reason, and to reduce frictional forces between the cam surfaces 83 and 84 and the cam surface 67, the former usefully curve slightly so as to follow such an arc as will readily be understood by reference to FIG. 3.

It will further be understood that the helical compression spring 59 will serve as a spring means to bias the latch bolt 56 into its door-latching position as actually shown in FIGS. 1 and 2. As will be explained hereinafter, additional spring means may, however, also be provided in the latch 10 for providing biasing action to urge the handles 20 and 21 into their neutral positions.

In order to permit the use of the latch 10 in doors of different thicknesses, the cam member 82 usefully has a transversely thickness which, as shown, is less than the transverse width of the elongated slot 64. A further useful feature to be noted about the construction of the latch 10 shown in the accompanying drawings is that the cam member 82 has such a height that the latch 10 can be installed in the door 12 in an especially simple manner by first inserting the handle 21 into the transverse opening 32 and then inserting the latch bolt assembly 50 into the passage 34 and rotating the latch bolt assembly 50 to cause the cam member 82 to be inserted into the elongated slot 64.

By providing the cam member 82 with the two cam surfaces 83 and 84, the latch 10 may be installed on a door at either side edge thereof without requiring any modification or adjustment of the latch itself. This is a particularly advantageous feature presented by the latches of the present invention.

Further reference will now be made to the elongated stem 41 and 42 of the handles 20 and 21 respectively to described the manner in which, in the particular latch 10 shown in the accompanying drawings, these stems co-engage in a sliding pivotal interfit to permit movement of the latch bolt 56 to be obtained by pivotal movement of both of the handles 20 and 21 and to permit such action to be obtained when the latch 10 is installed on doors of different thicknesses.

For this purpose, the elongated stem 42 of the handle 21 is integrally formed at its inner end with an open-topped channel 86 defined by spaced apart walls 87 and 88. These walls 87 and 88 are formed on their opposed surfaces with transversely extending grooves 89. A pair of pin-like projections 90 are provided on the inner end of the elongated stem 41 of the handle 20 and these projections 90 are pivotally and slidably received in the aforementioned grooves 89 of the elongated stem 42.

With this construction, pivotal movement of the handle 20 about its pivot pins 69 and 70 causes corresponding pivotal movement of the handle 21 about its pivot pins 69 and 70 to cause co-action of the cam members 82 and 67 to retract the latch bolt 56. It will also be understood that the sliding fit of the pin-like projections 90 on the stem 41 in the grooves 89 in the stem 42 permits the use of the latch 10 on doors of different thicknesses.

As already indicated, the latch 10 may, if required, be provided with spring biasing means in addition to the helical compression spring 59 for urging the latch bolt 56 into its door-latching position. From FIG. 3, it will be seen that the latch 10 is additionally provided with a spiral expansion spring 92, one end of which is received within the notch 93 formed in the upper surface of the elongated stem 42 of the handle 21. The spring 92 is coiled around a respective one of pivot pins 69 and its second end abuts an inner surface of the handle-mounting member 23 to urge the handle 21 to pivot so as to move the cam member 82 downwardly. This, in turn, permits the latch bolt 56 to move into its door-latching position under the action of helical compression spring 59.

In accordance with another useful feature of the invention, the latch 10 shown in the accompanying drawings is formed so that the inner ends of the anchoring portions 24 and 25 of the handle-mounting members 22 and 23 respectively engage the sleeve 52 of the latch bolt assembly 50 to prevent rotation of the handles 20 and 21 about their axes over the inner and outer faces 14 and 16 respectively of the door 12. For this purpose, the anchoring portions 24 and 25 are provided at their inner ends with corresponding opposed arcuate recesses 95 and 96 within which the sleeve 52 of the latch bolt assembly 50 is received.

A particularly important advantage of the latch 10 is that all the major structural components thereof can be manufactured from a plastics material, for example, by an injection molding technique. This is true of all the structural components except the springs 59 and 92, the bolts 35 and 36 and the pivot pins 69 and 70. Typical materials for this purpose are the acetal resin commercially available under the registered trade mark "Delirin" and glass-filled nylon. The manufacture of the latch from such materials is especially advantageous in that the casting and machining of metal components having complex shapes is avoided that the total manufacturing cost of the latch is substantially reduced.

While the manner of installing the latch 10 on a door and its mode of operation will be readily apparent from the description already given herein, such installation and operation will now be briefly summarized.

Assuming that the latch 10 is to be installed on the door 12 at the right-hand side edge thereof as actually shown in the accompanying drawings, the opening 32 and the passage 34 are first cut in the door in the required positions. The countersunk recess 55 is also formed for the end plate 51 of the latch bolt assembly 50.

The pivot pins 69 and 70 for the outer handle 21 are then inserted into the aforementioned aligned openings 71, 72 and 73, and 76, 77 and 78 respectively in the ears 74 and 79, the

stem 42 and the outer handle-mounting member 23. The latter is then inserted into the opening 32 in the door 12 as shown.

The latch bolt assembly 50 is next inserted into the passage 34 in the door 12 with its inward extension 63 disposed generally vertically. By inwardly depressing the head 57 of the latch bolt 56 against the action of the spring 59, the latch bolt 56 can be manually rotated in turn to rotate its inward extension 63 so that the cam member 82 of the stem 42 of the outer handle 21 is introduced into the elongated slot 64. The anchoring portion 24 of the inner handle-mounting member 22 is then inserted into the opening 32 in the door 12 as shown and the bolts 35 and 36 are inserted and tightened to hold the shoulders 28 and 29 of the handle-mounting members 22 and 23 respectively firmly against the inner and outer faces 14 and 16 respectively of the door 12, the sleeve 52 of the latch bolt assembly 50 being received within the arcuate recesses 95 and 96 at the inner ends of each of the anchoring portions 24 and 25.

Finally, the inner handle 20 is pivotally mounted in the inner handle-mounting member 22 by inserting the pivot pins 69 and 70 into the respective aligned openings 71, 72 and 73, and 76, 77 and 78. The installation of the latch 10 is now complete.

In operation, pivoting movement of the outer handle 21 about its pivot pins 69 and 70 by outward pulling on the top of the cross-head 40 of that handle or by inward pushing on the bottom of the cross-head 40 will cause generally vertical upward movement of the cam member 82 and consequently retraction of the latch bolt 56 against the action of the springs 59 and 92.

Alternatively, if the latch 10 is to be actuated by movement of its inner handle 20, such movement will be transmitted from the inner handle 20 by the engagement of the pin-like projections 90 on the elongated stem 41 of that handle 20 in the grooves 89 in the elongated stem 42 of the outer handle 21 to cause retraction of the latch bolt 56 in the same manner.

When the inner and outer handles 20 and 21 respectively are released, they are urged into their neutral positions by the spring 92 while the latch bolt 56 is moved outwardly into its door-latching position by the helical compression spring 59.

It should also be noted that, since the web 67 of the slot 64, which web functions as the first cam member of the latch 10, is formed with a double chamfer, the latch bolt assembly 50 can be mounted with either of the faces of the elongated slot 64 facing upwardly. Additionally, since the cam member 82 is provided with two cam surfaces 83 and 84, the latch 10 may be installed at either side edge of a door while ensuring that the heads of the fastening bolts 35 and 36 are always disposed in the inner handle-mounting member 22.

Although the invention has been described with reference to the particular embodiment thereof as shown in the accompanying drawings, it will be appreciated that numerous modifications can be made thereto without departing from the scope of the invention. In particular, it is to be noted that the cam member 67 and 82 may be constructed in other ways to provide the desired interaction therebetween.

What I claim is:

1. A latch for use in a door having a first face, a second face generally parallel to said first face, a side edge extending between said first and second faces, an opening extending through said door between said first and second faces thereof generally perpendicularly to said first and second faces of said door, and a passage extending from said side edge of said door into said opening, which latch comprises:

a pair of handle-mounting members each adapted to be secured in position about said opening extending through said door at a respective one of said first and second faces of said door;

first and second handles pivotally mounted on respective ones of said handle-mounting members about axes generally parallel to said passage in said door and each said handle having an elongated stem adapted to extend into said opening in said door;

a latch bolt adapted to be guided in said passage in said door for movement between an extended door-latching position and a retracted door-unlatching position;

a first cam member operatively associated with said latch bolt for axial movement therewith along said passage;

a second cam member operatively associated with said elongated stems of said first and second handles and adapted to be disposed in said opening in said door in engagement with said first cam member for generally translational movement of said second cam member in a cam plane disposed intermediate said first and second faces of said door and generally parallel thereto in response to pivotal movement of said first and second handles to move said latch bolt between said door-latching and door-unlatching positions; and

a spring means biasing said latch bolt into said door-latching position, whereby said latch bolt is moved from said door-latching position into said door-unlatching position on pivoting movement of either of said handles about their axes.

2. A latch as claimed in claim 1 in which each of said handle-mounting members includes an anchoring portion adapted to be received within said opening in said door and a shoulder adapted to abut a respective one of said first and second faces of said door and which latch additionally comprises a fastening means adapted to interconnect said handle-mounting members to maintain said shoulders thereof in abutment with respective ones of said first and second faces of said door.

3. A latch as claimed in claim 2 in which said latch bolt is slidably disposed in a guide sleeve adapted to be secured in said passage in said door and in which said anchoring portions of said handle-mounting members extend inwardly through said opening in said door to engage said guide sleeve to prevent rotation of said handle-mounting members.

4. A latch as claimed in claim 3 in which each of said first and second handles is pivotally mounted on a respective one of said handle-mounting members by axially aligned pivot pins adapted to be disposed outwardly of the respective one of said first and second faces of said door to extend through aligned openings through said handle-mounting member, through said elongated stem of said handle and through a pair of ears secured to said handle and axially spaced apart from said elongated stem thereof along said pivot pins.

5. A latch as claimed in claim 4 in which said handles and said handle-mounting members are formed from a plastics material and in which each of said first and second handles comprises a cross-head integrally formed with said elongated

stem of that handle.

6. A latch as claimed in claim 5 in which said cross-head of each said handle has a peripheral flange with a face panel secured on said cross-head within said peripheral flange.

7. A latch as claimed in claim 1 in which said second cam member is integrally formed with said elongated stem of said first handle and in which said second cam member has two opposed cam surfaces adapted alternatively to engage said first cam member whereby said first handle may be mounted on either of said first and second faces of said door.

8. A latch as claimed in claim 7 in which said first cam member includes an elongated slot adapted to be disposed axially within said passage in said door and in which said second cam member is adapted to extend into said elongated slot for cam action therewith.

9. A latch as claimed in claim 8 in which said second cam member and said elongated slot of said first cam member are so dimensioned that said second cam member may be introduced into said elongated slot of said first cam member by manual rotation of said latch bolt within said passage in said door.

10. A latch as claimed in claim 1 in which said first and second cam members are adapted for co-engagement over a predetermined transverse distance between said first and second faces of said door whereby said latch can be used on doors having thicknesses within a predetermined range of values.

11. A latch as claimed in claim 10 in which said second cam member is integrally formed with said elongated stem of said first handle and extends through an elongated slot in said first cam member for cam action therewith, in which said elongated slot has a finite width between said first and second faces of said door whereby said second cam member can engage said first cam member at different transverse positions in said elongated slot in accordance with the thickness of said door, and in which said elongated stems of said first and second handles co-engage in a sliding pivotal interfit within said opening in said door to permit pivotal movement of said handles.

12. A latch as claimed in claim 11 in which said sliding pivotal interfit is formed by a channel defined by side walls provided at the end of said elongated stem of one of said handles, said side walls having confronting grooves in their opposed surfaces, and by pins on said elongated stem of the other of said handles, said pins being slidably received within said grooves.

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